



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 950 540 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.10.1999 Bulletin 1999/42

(51) Int. Cl.⁶: **B41M 5/035, B44C 1/17**(21) Application number: **99107088.9**(22) Date of filing: **12.04.1999**

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

Designated Extension States:

AL LT LV MK RO SI(30) Priority: **15.04.1998 IT MI980780**

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(54) **Process for the production of variously painted and/or decorated artefacts by means of the technique of transfer from a sublimable colour support**

(57) Process for the production of variously decorated artefacts, comprising the steps of: preliminary preparation of the surfaces of the artefact, possible application of preliminary painting cycles or other surface treatments; covering or tight-wrapping up of the artefact with a transfer support bearing the decorations desired, realised from gas-tight thermoformable plastic material such as polyvinyl alcohol; creation of a vacuum between said transfer support and the artefact covered by the same, so that the support adheres to the shape of the artefact; and heating for the transfer of the decoration and the polymerisation of the colours

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Description

[0001] The present invention relates to a process for the realisation of artefacts from various materials, such as metals, ceramics, wood, plastics or the like, of various sizes and/or variously decorated.

[0002] More particularly, said process allows to obtain various surface finishings such as wood grains and marble veins or other patterns, and to transfer on the piece and/or the surface of the artefact to be decorated any ornamental pattern, even a complicated one, without deformations or defects of said pattern.

[0003] As is known, the present processes for the realisation of the decoration on metals involve realisation difficulties and complexities due to the fact that they require more or less automated systems which operate on the flat surface of strips or plates.

[0004] Processes and related apparatuses are known which allow to realise a polychrome and complex decoration on artefacts of various type and also having a non-flat surface, by means of the technique of the transfer of a pattern from a flexible support to the surface of said artefact by ink sublimation. As is known, such technique comprises the following steps: wrapping up the artefact with a support containing the sublimable decoration, usually from paper, fabric or the like; inserting the artefact wrapped up in the transfer support into a container made of two elastically deformable membranes fixed to two substantially rectangular frames hinged with each other; obtaining a vacuum in said container, so that the flexible membranes adhere to the artefact pressing the support against the surface of the artefact; and submitting then the whole to heating.

[0005] The pressure and the heat may be obtained by resistance heating, infrared rays or also an oil-bath oven. In this case, the piece to be decorated, suitably wrapped up by the decoration transfer support, is immersed in the oil-bath oven, protected by an envelope or bag from elastically-deformable, high-temperature-resistant material. Processes of this type and the related apparatuses are described, for instance, in FR 2203321 (VILLEROY), EP 544603 (CLAVEAU), EP 451067 (CLAVEAU), and EP 606189 (CLAVEAU).

[0006] However, the above processes have the drawback that the pressure exercised by the elastically deformable membranes is not always uniform on the whole surface of the support, and therefore irregularities can occur in the transfer of the decoration. Besides, it may happen that, during the creation of the vacuum, folds form in the support that wraps up the artefact, with ensuing defects in the transfer of the decoration and ensuing rejection of the decorated artefact obtained.

[0007] Besides, the transfer decoration processes according to the known art are rather complex and delicate as they require the use of the elastically deformable membranes which, besides, are liable to deteriorate and must be periodically repaired or replaced.

[0008] It is also known that all decorated artefacts

must be suitably protected to prevent the deterioration from being damaged during the handling and transportation of the artefact or the installation or assembly of objects employing the decorated artefact; a system commonly used to protect the artefact consists in covering the same with a film from plastic material or the like, easily removable, which is removed once the decorated artefact has reached his destination or has been installed. This operation of protection of the artefact involves, consequently, additional costs that affect the overall cost of the artefact.

[0009] Object of this invention is to provide a process for the realisation of artefacts from various materials, such as steel, metal alloys, wood, plastics, ceramics, and the like, and also of big size, for instance, extruded artefacts with a length of up to 20 m, and rigid folded and shaped plates, so decorated as to reproduce exactly the aesthetic effect of various materials, such as wood, marble and the like, or anyhow provided on all the surface or part thereof with any ornamental pattern (floral, geometric or else), however complex and elaborated.

[0010] A further object is to provide various artefacts, variously decorated on the surfaces designed to remain on sight, also with complex patterns, that are substantially devoid of defects, irregularities in the pattern, and the like.

[0011] Another object of the invention is to provide a process of decoration by transfer comprising a reduced number of operating steps, particularly simple and highly reliable, that can lead to the realisation of finished and decorated artefacts suitable for many applications in many goods sectors, such as building, furniture, electric household appliances, domestic articles, and the like.

[0012] Still a further object of the invention is to provide a process of decoration of various artefacts allowing to obtain, through the same decoration process and without additional steps, an artefact whose surface is already protected by a covering film to be removed after the transportation and/or the installation of said artefact.

[0013] These and still other objects that will be more clearly stressed by the following description are achieved by a process for the realisation of various artefacts painted and/or variously decorated, from metals, ceramics, wood, plastics and the like, utilising the technique of the transfer of patterns or figures, monochromatic or polychromatic, reproduced on a transfer support by the combined action of pressure and temperature, which process, according to the present invention, comprises the following steps:

- submitting the raw artefact to be decorated to possible operations of preparation of the surfaces, such as cleaning, degreasing, chemical and/or electrolytic conversion, and possibly to one or more preliminary painting cycles, realisable with the use of liquid or powder paints, to avoid diffusion phenom-

ena with the colours of the transfer support,

- performing the wrapping up or tight-covering of the artefact to be decorated, with a sublimable colour transfer support, having the form of a sheet, strip, bag or envelope, comprising a supporting base from gas-tight thermoformable plastic material, the pattern or decoration to be transferred to the artefact to be decorated being carried on said support base,
- creating a vacuum between said artefact and said support, so as to cause the transfer support to uniformly adhere to the surface of the artefact to be decorated,
- submitting the so treated artefact to a heating action at temperatures on the order of 200-230°C, for a time of from about 30 seconds to 30 minutes, to perform the transfer and the polymerisation of the final colours from the transfer support to the artefact,
- removing, after the cooling and possibly after the handling and/or the installation of the decorated artefact, said exhausted supporting base from the decorated surface of the artefact.

[0014] More particularly, said supporting base from thermoformable, gas-tight plastic material is constituted by polyvinyl alcohol.

[0015] It has been found that the transfer support realised from polyvinyl alcohol according to the present invention, which is gas-tight and thermoformable and which has also an excellent resistance to traction, allows to obtain the vacuum directly between the artefact to be decorated and the support, and also to realise a perfect and uniform adhesion of the support to the artefact, eliminating in this way possible working rejects and greatly simplifying both the process and the installation, as well as the equipment necessary to realise it.

[0016] It has also been found that said exhausted supporting base, i.e. having no longer the pattern or decoration once this has been transferred on to the artefact surface, carries on the function of a protecting film of the decorated surface of the artefact and the same artefact, protecting it from blows, scratches and the like during the steps of storage and/or transportation, during the operations of installation, such as for instance, sawing in case of profiles for doors and windows, and the like, rendering in this way superfluous the application of the special protective films or paints, and allowing in this way a remarkable saving in both the protective material and the time employed to perform the application of said protecting material.

[0017] According to a variant of this invention, said artefact wrapped up or covered with said sublimable colour transfer support which adheres by effect of the vacuum to the surface to be decorated, is submitted to a first intermediate heating action at a temperature at which the thermoforming occurs, i.e the permanent adhesion of the transfer support to the artefact support,

even at a temperature lower to that at which the transfer and the polymerisation, and therefore the consolidation of the sublimable colours, occur.

[0018] This operation, carried out for instance at a temperature of from 100°C to 150°C for a period of some minutes, allows for instance to rationalise the working cycle, by effecting an intermediate storing of the artefacts covered with the support, even though they are not finished, and to complete the cycle, according to the requirements, the demand of the market or the like.

[0019] Always according to the present invention, in order to ensure the adhesion of the inked support to the artefact to be decorated and/or to prevent deformations in the open profile artefacts, counter-templates or pads are applied in the cavities or recesses of the artefact to be decorated.

[0020] The counter-template is utilised in order to contrast the stresses ensuing from the creation of the vacuum, avoiding in this way deformations in the pieces to be decorated. The counter-template or pad may be obtained from any rigid or semi-rigid material resistant to work temperatures. Advantageously, materials such as silicone rubber, wood, aluminium, steel, etc., may be used.

[0021] More particularly, said final heating action is carried out by means of a set of infrared ray lamps, or said heating is carried out in the inside of a tunnel-oven or the like, with hot air circulation, produced by any energy source.

[0022] The final heating temperature is preferably maintained for a time of from 30 seconds to 30 minutes, having care to keep it under the decomposition temperature of polyvinyl alcohol or other thermoformable material.

[0023] The process object of the invention utilises for the applications on the section inks suitable even for outdoor exposure.

[0024] After the suitable and known operations of preparation of the surfaces to be decorated, there may be performed, as already said, one or more preliminary painting cycles, obtainable with either liquid or powder paints, having the purpose of obtaining the background colour, and a possible transparent layer to prevent phenomena of diffusion with the transfer colours from the support (transfer). Besides, for the practical realisation of the process according to the present invention, various apparatuses may be utilised that allow to decorate artefacts of any shape and size, such as household articles, bricks, cans, vases and even open or closed section profiles of a length of up to about 20 meters, as well as folded and shaped plates having a size suitable to constitute parts of pieces of furniture, electric household appliances, such as refrigerator doors and the like.

[0025] An apparatus suitable to realise variously decorated artefacts according to the present invention comprises:

- a work bench whereon an artefact to be decorated,

possibly suitably pre-treated (cleaned, degreased and already treated with one or more preliminary layers of paint or submitted to colourless or coloured anodic oxidation) rests, and on which bench said artefact is prepared by tight-closing it in the transfer support;

- a device to create a vacuum between said transfer support and the artefact to be decorated, so that said support adheres and exercises a pressure on said wrapped up artefact;
- heating means located above said work bench, associated to ventilation and air circulation, positioned in a special hood.

Said transfer support may have the form of a sheet to be laid down on the surface to be decorated of the artefact placed on said work bench, through which a vacuum is obtained, or the form of a first sheet placed above the artefact and a second sheet placed under the artefact, shaped like a bag, a stocking or the like.

[0026] More particularly, said heating means may be advantageously constituted, for instance, by a battery of infrared ray lamps in a ventilated air room.

[0027] It has been found in the practice that the above described process allows to perfectly transfer the decorations present on the transfer support on all of the zones, event not flat, of the profile, which allows to perfectly decorate even profiles having a section complex and of any size.

[0028] Obviously, in the practical realisation, structurally and functionally equivalent modifications and variants may be made to the invention as described, illustrated and claimed, without departing from the protection scope of the invention.

Claims

1. A process for the realisation of painted and/or variously decorated artefacts from metal materials, ceramic materials, wood, plastics and the like, utilising the technique of the transfer of monochrome or polychrome patterns or figures reproduced on a transfer support, by means of the combined action of pressure and temperature, characterised in that it comprises the following steps:

- submitting the raw artefact to be decorated to possible operations of preparation of the surfaces, such as cleaning, degreasing, chemical and/or electrolytic conversion, and possibly to one or more preliminary painting cycles, realisable with the use of liquid or powder paints, to avoid diffusion phenomena with the colours of the transfer support.
- performing the wrapping up or tight-covering of the artefact to be decorated, with a sublimable colour transfer support, having the form of a sheet, a strip, a bag or an envelope, comprising

a supporting base from gas-tight thermoformable plastic material, the pattern or decoration to be transferred on to the artefact to be decorated being carried on said supporting base,

- creating a vacuum between said artefact and said support, so as to cause the transfer support to uniformly adhere to the surface of the artefact to be decorated,
- submitting the so treated artefact to a heating action at temperatures on the order of 200-230°C, for a time of from about 30 seconds to 30 minutes, to perform the transfer and the polymerisation of the final colours from the transfer support to the artefact,
- removing, after the cooling and possibly after the handling and/or the installation of the decorated artefact, said exhausted supporting base from the decorated surface of the artefact.

2. The process according to claim 1, characterised in that said supporting base from gas-tight thermoformable plastic material is constituted by polyvinyl alcohol.

3. The process according to claim 1, characterised in that said artefact wrapped up or covered with said sublimable colour transfer support adhering by effect of the vacuum to the surface to be decorated, is submitted to a first intermediate heating action at a temperature at which the thermoforming occurs, i.e. the deformation and permanent adhesion of the transfer support to the surface of the artefact.

4. The process according to claim 1, characterised in that said transfer support has the form of a sheet to be laid down on the surface to be decorated of the artefact placed on a suitable work bench through which a vacuum is obtained, or the form of a first sheet placed above the artefact and a second sheet placed under the artefact, shaped like a bag, a stocking or the like.

5. An apparatus for the realisation of the process to decorate artefacts according to the process of claims 1 and 2, characterised in that it comprises:

- a work bench whereon an artefact to be decorated, possibly suitably pre-treated (cleaned, degreased and already treated with one or more preliminary layers of paint or submitted to colourless or coloured anodic oxidation) rests, and on which bench said artefact is prepared by tight-closing it in the transfer support;
- a device to create a vacuum between said transfer support and the artefact to be decorated, so that said support adheres and exercises a pressure on said wrapped up artefact;
- heating means located above said work bench,

associated to ventilation and air circulation,
positioned in a special hood.

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EP 0 950 540 A3

(12)

EUROPEAN PATENT APPLICATION(88) Date of publication A3:
07.03.2001 Bulletin 2001/10(51) Int. Cl.⁷: **B41M 5/035**, B44C 1/17(43) Date of publication A2:
20.10.1999 Bulletin 1999/42(21) Application number: **99107088.9**(22) Date of filing: **12.04.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
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EUROPEAN SEARCH REPORT

Application Number
EP 99 10 7088

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Place of search THE HAGUE		Date of completion of the search 12 January 2001	Examiner Balsters, E
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EPO FORM 1501/02 (P4/C2/1)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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